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Botanical Science in Miami University College of Liberal Arts

The problem of the place of any branch of learning in colleges of liberal arts is a large one. Many subjects have disciplinary and practical worth, and we are compelled to weigh values as carefully as possible and to give place to any particular subject only after mature consideration. Coincident with the expansion and adjustment in other directions in Miami University, it has been thought wise to establish a department of Botany, on the supposition that the branch is one worthy of a place in the curriculum. With the establishment of the new department, we may very profitably consider the place of botanical science in our institution. And this is a different, and perhaps an easier, problem than would be the consideration of the place of Botany in colleges of liberal arts in general. Each institution has its peculiar function to perform, and every teacher worthy of the name has his own conception as to the most important content of his subject and the best method of presentation; hence the scope of our inquiry is considerably limited.

While not attempting to consider fully botanical science in its general academic relations, it seems necessary before passing to a consideration of the place and the function of the science in our institution, to state briefly and all too incompletely what the word Botany signifies to the botanist and to the student properly trained in the subject. Doubtless many readers can recall their studies in Botany, in which all or nearly all the time was given to the seed-plants, one of the six phyla of the plant world. Who would think of giving

the same time to insects, calling such a study a course in Zoology? Yet the insects form a larger portion of animals than do seed-plants of plants as a whole. Again, who would offer a course in a foreign language, confined to consideration of the conjugations and declensions? Nevertheless, the conception which many persons have of Botany shows only too plainly the imprint of quite as partial a presentation. Botany as a pure science has to do at least with the morphology, the ecology, the physiology and the taxonomy of all plants from the lowest to the highest. Again, each of these general departments of the subject is capable of much subdivision, and if we pass to the field of applied Botany, this phase of the science is quite as rich in present expansion and future possibility. Indeed, when one gets well into the subject, he finds that, in its present state of development, it is impossible for any man to be thoroughly well informed in all aspects of the subject; nor is there an institution where all the phases, even of pure botanical science, are presented in any sort of fashion. And thus it appears that the days of the old fashioned idealistic morphology, based largely on a taxonomic knowledge of flowering plants, have passed; with them has disappeared the institution that could boast that its field in Botany was as large as the science. So every institution of liberal culture must solve its own botanical question, and the kind and amount of Botany that obtains will depend upon its needs as seen by all interested, and especially by the man or the men in charge of the work.

Botanical opportunity is rapidly increasing, both for the student of pure botanical science and for the man or woman who turns to some feature of applied Botany. Applied Botany has extensively invaded the fields of agriculture, manufacturing and commerce in one way or another and is in turn very largely the outgrowth of studies in the pure science. The research student makes the discovery, and the man who devotes himself to applied Botany takes advantage of the results of research for himself, for some corporation, or for the state or nation. For this reason Botany is coming to get its full share of support from institutions of learning, from states and from nations; and it is apparent enough that the

subject is an important one for its own sake, wholly aside from its value in a course in liberal arts. The science is now doing its full share both in a technical way and in the field of economics, and its growth in the last decade is a marvel to all who have carefully watched the great expansion. Witness the great growth of state and national departments of agriculture with all their divisions and bureaus and the beginning of establishment of botanical research laboratories. Note that there is wonderful activity in Botanical research, such an institution as the Carnegie sending out more researches in Botany than in any other science. Then there is great demand for teachers of Botany in high schools, where young men and women are needed who have not simply had nature study work, good as that is, but who have had as good a training in the science as can be obtained in undergraduate courses, and this supplemented by graduate study if possible. In most states Botany stands second only to Physics and Geography among natural and physical sciences, as to number of courses given in high schools, and it is incumbent upon institutions of higher learning to see to it that the botanical instruction in high schools is up to the high standard attained in Physics as soon as we can turn out a sufficient number of teachers well prepared in the subject. Thus it is an important part of our work in the college of liberal arts to give instruction in Botany for its own sake.

All branches of learning are related, all educational values are relative, and it is scarcely possible to ascribe to one subject a kind of value not found in greater or less degree in some other. Yet, if we compare Botany with the other biological science, we find that it has certain special advantages as a subject used in liberal culture courses. Plants are more abundant than animals and are therefore more accessible for study in the field and in the laboratory. The plant tissues are more easily manipulated in the laboratory than are animal tissues, and the plant structures stand out more plainly. Reproductive processes can be studied much more easily in plants than in animals. Also, plants stand in closer relation to the inorganic world than do animals, being, so to speak, intermediate in a chemical and physiological sense;

and this fact gives them another kind of special value as objects of study. Plant evolution has taken a direction quite different from animal evolution, involving alternation of generations and almost total loss or suppression of sense organs and nervous tissue, so that Botany has a special kind of interest from the standpoint of racial development. Finally, we are convinced that plants are of greater economic value to man than animals, excluding man himself, and that the economic phases of Botany are of greater importance than those of any other subject in the realm of science. It is admitted readily enough that the last statement is debatable, but even if it is an exaggeration, there are quite as many special features within the field of applied Botany as have been pointed out in the pure science. Biologists have no quarrel regarding the relative merits of Botany and Zoology as subjects of instruction, and it would be a most ungracious procedure for any botanist or any zoologist to attempt to prove his science superior to the other closely related science as a whole, and quite as impossible for him to maintain his position. So it is in order, in concluding this paragraph, to repeat that the object has been to bring out the special merits of Botany, without any thought of attempting to say that it is superior as a whole.

It has been the view of the writer during all of his teaching experience that the morphological side of botanical science is the one which should have the first place in elementary courses in colleges, the courses covering all the great classes of the plant kingdom and including a consideration of life histories, racial development, relationships, methods of life and classification. But it must not be overlooked that, with the modern tendency toward specialization, has come a feeling of the greater need of correlation, so that, as we come into possession of a more complete knowledge of our subject, the old line of demarcation between its various aspects tends to disappear. For instance, the morphologist who has also a general view of plant physiology unconsciously brings the facts of physiology to bear upon his morphological instruction, thereby greatly enriching the course. Nor should it be supposed that courses in morphology will be given in Miami University to the exclusion of important work in physiology

and ecology, simply leaving these two subjects of growing importance to such frequent incursions as may be profitably made from the courses in morphology. Again, our conditions seem to demand recognition of some of the phases of applied Botany.

While it is not the belief of the writer that a course having a technical end in view has the same kind of value as a course designed primarily for liberal culture, yet we cannot afford to ignore the applied aspects of such a science as Botany. For instance, a course in medical Bacteriology has not as much cultural value as a course in general plant morphology, with its broader scope, in which frequent incursions may be made into other fields of botanical science and in which the relations of botanical science as a whole to other branches of liberal arts can be brought out briefly without making a hotchpotch of the subject. In the courses in applied science the practical end must be kept so constantly in mind that the cultural aspects are lost sight of to a greater or less degree. However, we must give our botanical students some knowledge of the great fields of economic Botany, such as the prevention of infectious diseases, the fertilization of soils through the use of nitrogen-fixing bacteria, the improvement of our economic plants and the introduction of new ones, the investigation of fungal and other plant diseases and the very important work in Forestry. It will be impossible in the immediate future to give courses in other aspects of applied Botany than Bacteriology and Dendrology, but advanced students will be given some knowledge of other fields through seminar work. Mr. B. T. Galloway, Chief of the Division of Plant Pathology at Washington, in discussing the recent expansion in economic Botany, writes as follows,—"In the light of these developments, an important question to consider is: Where are the workers to be trained? Undoubtedly in the future much greater interest will be taken in botanical work in our educational institutions, for it is gradually coming to the knowledge of young men that there is a demand for persons trained in plant lines. As a matter of fact, during the last few years the supply of such men has not been equal to the demand." Our work must be primarily along the lines of

pure botanical science, but the knowledge gained in them, besides its value in liberal culture, lies at the basis of all work in applied Botany, so that the student who would eventually enter some field of economic Botany must have first the knowledge given in our courses in pure Botany.

It would require too much space to attempt to state here precisely what we will include in our courses in morphology, ecology, physiology, bacteriology and dendrology, nor would such a procedure be in order at this time. In fact, the content of any course in a rapidly growing science must change so rapidly that any statement that might be made would begin to become antiquated before the printer's ink were dry. But if anyone still supposes, after reading this paper thus far, that we will teach students to know this or that plant simply as a matter of curiosity or knowledge, throw the thought to the winds; for this is not the important feature of the work, though it may be the part that first presents itself to one who sees a class at work, just as one who cannot appreciate music sees in the performance of an accomplished pianist only a display of physical energy. The student in our courses, it is hoped, will find that there is excellent opportunity for the study of cells, tissues, organs, structure, function and development, requiring unprejudiced and most careful observation, reasoning and judgment at every turn. Here, too, he will find opportunity to work with his hands while disciplining his mind and will be referred to original sources or thrown on his own resources often enough so that he will catch the spirit of original investigation in his undergraduate work. In college courses must come discriminating comparisons of function, form and symmetry; considerations of the origin of tissues and organs, discussions of differentiation and integration, correlations, homologies and analogies; and minute studies of reproductive processes, alternation of generations, changes of form and function, and probable lines of plant evolution.

It must be the constant aim of the department to keep abreast of the best thought in the various lines of botanical work undertaken. The morphology given must not be of the older disconnected sort, but must be rather a philosophical morphology based upon relationships, making the subject a

connected whole as much as is a course in mathematics. The work in other lines must also be kept up to the best thought along these lines. In order to accomplish this purpose there must be constant revision and expansion in the department, and an intimate relationship must exist between our lecture room and laboratories and those of other institutions, through recourse to literature and through correspondence and visits. And once more, quite apart from Botany itself, an attempt will be made at all times to correlate the subject by occasional incursions into other fields of liberal culture such as Zoology, Palæontology, Geology, Geography, Sociology, Philosophy, Psychology, Physics and Chemistry; not for the sake of these branches, but for the purpose of giving the student a knowledge of the inter-relationships of various subjects with special view to their bearing upon botanical science. Such incursions must consist of a word not indulged in frequently enough to lessen in any degree the continuity of the courses in Botany, but merely introduced at pertinent points, in such a manner as to make for breadth of culture.

And we are not pleading for a kind of botanical instruction which will have in view only the training of students who are to become botanists. The instructor just from the university too frequently emphasizes this phase of the subject, measuring his success as a teacher too much by the number of students that he sends on into the graduate courses. On the other hand, the teacher must remember that, worthy as is the ambition to send some of his students on into advanced courses and research or into the economic phases of his subject, a more important part of his task in the college of liberal arts at least is training for citizenship and right living. Then in teaching a first course, and even in all subsequent work, the teacher must not lose sight of the fact that there is in reality a very close relationship between his science and good citizenship and real strength of character.

In thus instructing for strengthening character and for aiding highest living, the teacher must inculcate the scientific method, which has in recent years gained ground everywhere and is making so much for intelligent, strong and useful liv-

ing. Nor may he neglect to give his pupil such a view of the plant world as will enable him to appreciate it, to enjoy it and to make the best of it for himself and for the community, the commonwealth, the nation or the world. The student of Botany should learn to approach a problem without any fixed prejudice and often without any knowledge as to what its study is to reveal; he should observe, compare and gradually arrive at a conclusion.

And this is not a matter of text-books, nor indeed can it be more than suggested in the best book. It is rather a matter of method of teaching. It frequently takes the student away from the text-book and lecture room, leading him to the laboratory and to the field where he may observe and draw conclusions and thus become in some limited sense an investigator for himself. So even the field work becomes a real and vital portion of botanical instruction, the trips not being picnic parties as may appear to an outsider, but a means by which much vital instruction can be given and the student can be brought into contact with the plant world very much as he will see it in after life. Here then the student comes to appreciate plants as they live and perform their functions and not as they appear as lifeless things in laboratories, museums and herbaria. Here too as well as in the laboratory is unfolded to the observer much of the beautiful adaptation of the plant to its environment, so that in the field the student may be taught to reason and draw conclusions. Thus both in the laboratory and in the field he may be trained to approach problems without prejudice, to observe things as they really are, often quite different from the statement of the best text-book or teacher, and to report just what he sees. Who can doubt that this kind of study will aid greatly in training the student in the habit of patient and unprejudiced consideration of the great problems of life, and aid in securing some of the highest qualifications for helpful and noble citizenship?

Finally, it will be understood readily enough from the above statements that the writer does not regard the imparting of knowledge of Botany for the sake of the science as the most important object of a course in his subject. He does not admit that Botany is inferior to any other subject in valuable

content, but he does hold that the teacher who, in any subject makes mere knowledge the prime object of instruction, is not fit to hold a chair in any institution whose object is liberal culture. The information acquired as to plant forms and relationships, their character and uses and the inter-relations of the various phases of the subject as well as its relations to other branches of learning is important and will be found a source of constant enjoyment and profit in after life. But we must place enjoyment and utility for selfish ends after training for character and citizenship. And while the content of Botany is of such a nature that the subject naturally conduces to high thinking, in this branch, as in any other, success in the realization of our ideals depends very largely upon the method of presentation and what the instructor demands of the student in way of careful, consciencious work and honesty of purpose.

BRUCE FINK.

Faculty Changes at Miami

Besides the substitutes for the four who are gone, permanently or on leave, seven additional names appear on the faculty roll at the opening of the new year. The University is much strengthened by these accessions, and another stride is made in the steady advance of Greater Miami.

Principal Lantis, and Director Davis, of Manual Training, have resigned, while Professors Hoke and Parker are absent on leave for the year, the former studying in Europe, the latter at Columbia University. The courses in Education will be in charge of Professor Warren Darst, A. M., for the past two years a valued member of our summer term faculty.

BRUCE FINK, PH. D., Professor of Botany and Bacteriology, is the first head of this newly created department. He earned his B. S. at the University of Illinois in 1887, and his M. S. there also in 1894. He studied at Harvard, being laboratory assistant and graduate scholar, and receiving his A. M. in 1896. He then did graduate work at the University of Minnesota, winning his Ph. D. in 1899. After five years' service as principal of public schools, Dr. Fink was Professor

of Biology at Upper Iowa University from 1892 to 1903, with leaves as noted above for graduate work; then from 1903 to 1906 Professor of Botany at Iowa College. He has contributed largely to botanical and other scientific journals, and is member of several scientific societies.

The erection of this chair is of prime importance, and Dr. Fink expounds the significance of the new department and courses in an extended article in this issue of the Bulletin.

Benjamin Marshall Davis, Ph. D., Professor of Elementary Agriculture in the Ohio State Normal School of Miami University, first fills a chair which fairly rivals the one just treated. His B. S. is from an Indiana college, his graduate work done at the University of California, which granted him Ph. D. last year. He has taught at the Southern University of California and at the State University at Berkley, and has for several years held the chair of Elementary Agriculture at the State Normal School at Chico, Calif. He has contributed many articles to the magazines of the Pacific slope. Professor Davis will enter upon his new duties at Miami next January, and his coming will inaugurate a new era in normal training in Ohio, whose significance to the commonwealth cannot adequately be foretold.

Fred Campbell Whitcomb, B. S., Professor of Manual Training, and Director of Arts and Crafts, received his B. S. from Franklin College, Indiana, and studied one year at Indiana University. A graduate from the two-year professional course at the Trachers' College of Columbia University, with the diploma for teaching Manual Training, he did subsequent work at Pratt Institute and Columbia, holding at the latter a graduate scholarship. After high school principalships in Indiana, he has for two years been Professor of Manual Training and Director of the School of Manual Arts organized by him at Howard University, Washington, D. C. Professor Whitcomb has written series of articles for professional periodicals, and is a member of the leading learned societies in his line.

Alfred Horatio Upham, A. M., was graduated an honor man of the class of '97 at Miami. The year following

he had charge of the department of Latin during the absence of Professor Langsdorf. Receiving his A. M. in 1898, he remained for two years longer as instructor in Latin and Greek in the Preparatory. Then came two years graduate work in English under Professor Kittredge at Harvard, which gave him A. M. in 1901. From 1902 to 1905 he was Professor of English in the Agricultural College of Utah. Last year he was Columbia University Fellow in Comparative Literature studying under Professors Fletcher and Springarn, and partially completing a dissertation on the French Influence in English Literature from the Accession of Queen Elizabeth to the Restoration.

William Henry Whitcomb, M. S., Assistant Professor of Chemistry, attended the Massachusetts Institute of Technology, and received the degree of B. S. in Chemistry in 1903. The next year he was Assistant in Physics and Electro- and Physico-Chemistry in his alma mater and the following year he remained as fellow and took his M. S. Last year he served there as Assistant in Physics.

William Ferdinand Luebke, A. M., Assistant Professor of German, earned his A. B. at the Northwestern University of Watertown, Wis., in 1903. A year later he took the same degree from the University of Wisconsin, remaining another year as graduate scholar in German. Last year he taught German in the Waukesha, Wis., High School and put in the summer of 1906 in graduate work in German at the University of Chicago.

Raymond Vincent Phelan, Ph. D., Assistant Professor of Economics and Sociology, attended Adelbert College of Western Reserve University, in 1902 received his Ph. B. from Western Reserve, and two years later his A. M. During 1904-5 he held the graduate scholarship in Economics at the University of Wisconsin and, for the following year, the University fellowship in Economics there, receiving his Ph. D. from Wisconsin last June. For two summers past Dr. Phelan has been Special Agent of the Wisconsin State Tax Commission. He is the author of The Financial History of Wisconsin and

the writer of various articles on economic, historical, and literary subjects.

Mrs. Carrie Putnam Herndon, Ph. M., comes to Miami as Instructor in History in the Normal College. She was graduated from the Illinois State Normal University in 1893 with the honors of the class. Five years service as teacher in the Morgan Park Schools preceded a course at Chicago University, whence she took her Ph. B. in 1901, with honorable mention. For the next year Mrs. Herndon was Critic Teacher in the Chicago Normal, then for three years Professor of History in Southwest Kansas College. Last year she held a scholarship in History at Chicago University which granted her the Ph. M. last June upon the Thesis "The Financial Policy of Mirabeau.

Raymond Hugh Burke, B. S., Instructor in Geography and Nature Study, was from 1902 to 1905 a student at Oberlin College. After extensive travels in the southwestern United States for purposes of study, he returned to the University of Chicago, where he studied last year and last summer. Chicago granted him B. S. last June and during the past summer term he supplied Professor Hoke's place at Miami. An experience as teacher in the country schools adds a valuable element to his equipment for work in our Normal College.

Omer Konn Boring, Instructor in Spanish, after two years as student at Miami, went to Paris in the spring of 1904 and attended the summer school of the Alliance Francaise, graduating from the same with the Diplome Superieur. Then followed a sojourn of eighteen months in Spain, for one year of which he was in Madrid as a student at the Universidad Central, pursuing courses in the history of Spain and of Spanish literature. He returned for the spring term of 1906 at Miami, and expects to take his degree next June, meanwhile giving instruction in Spanish and French.